Dec. 28, 1926. 1,611,933

C. A. MATSON

LACE TIPPING MACHINE

Filed Feb. 19, 1924 4 Sheets-Sheet 1

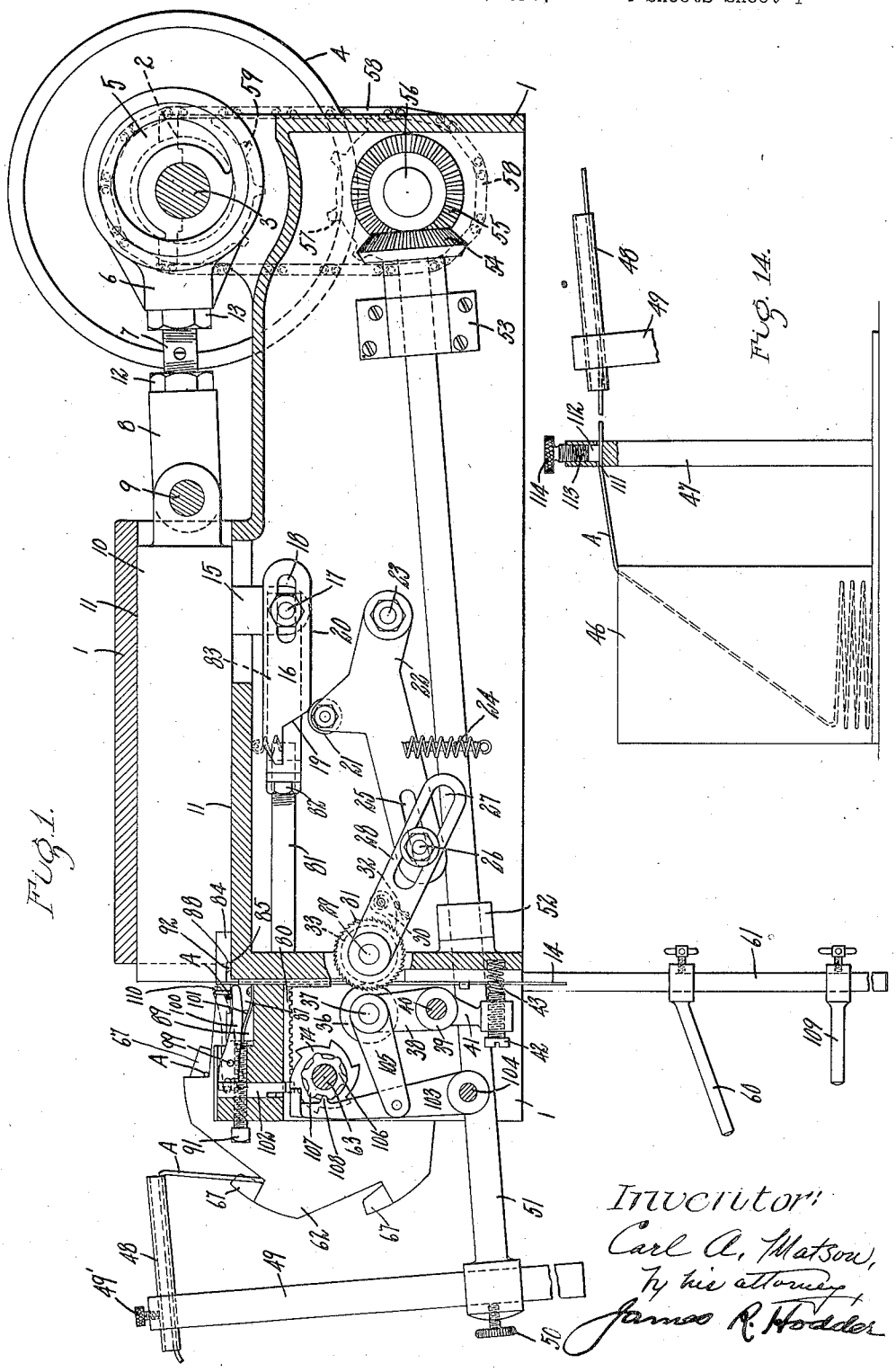


Fig. 1.

Fig. 14.

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LACE TIPPING MACHINE

Filed Feb. 19 1924 4 Sheets-Sheet 2

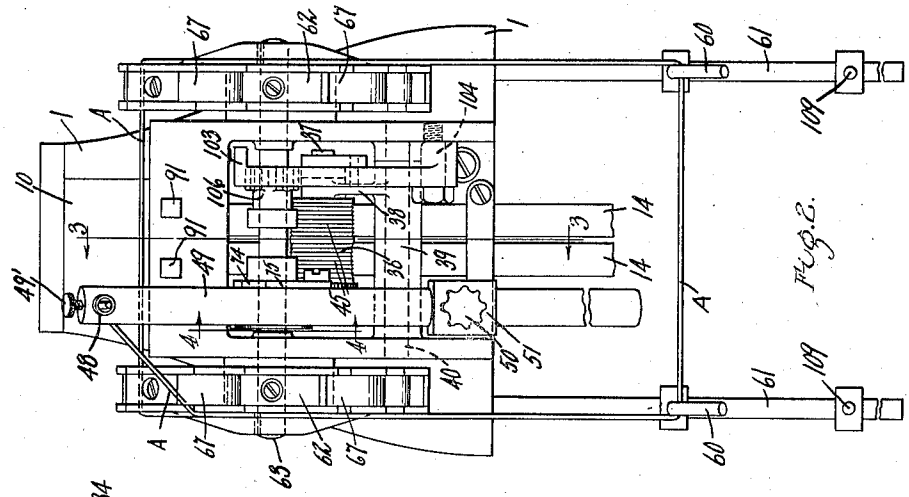


Fig. 2.

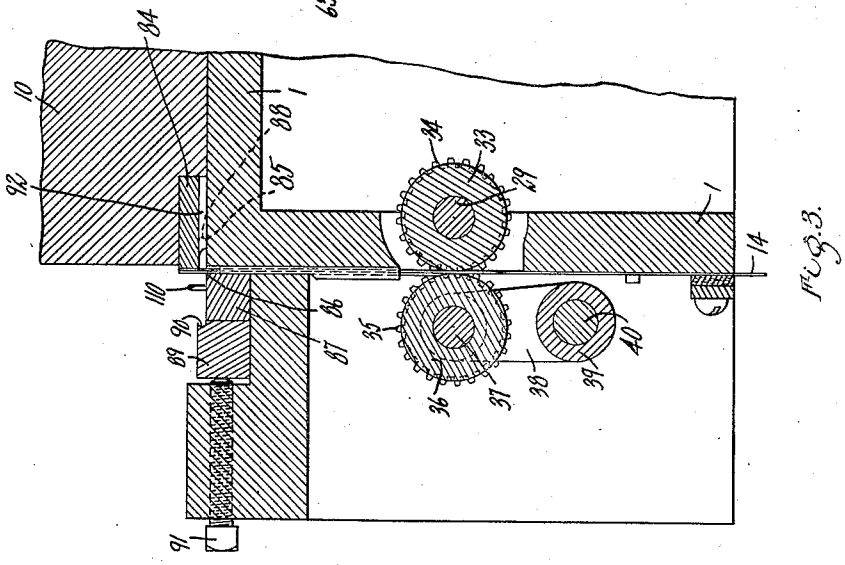


Fig. 3.

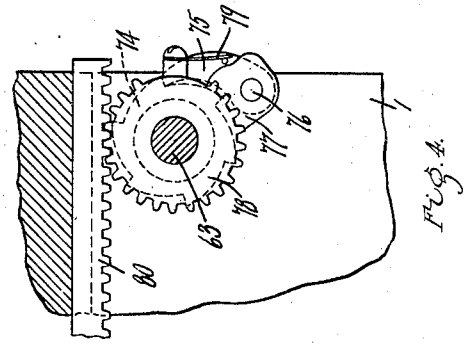


Fig. 4.

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LACE TIPPING MACHINE

Filed Feb. 19, 1924 4 Sheets-Sheet 3

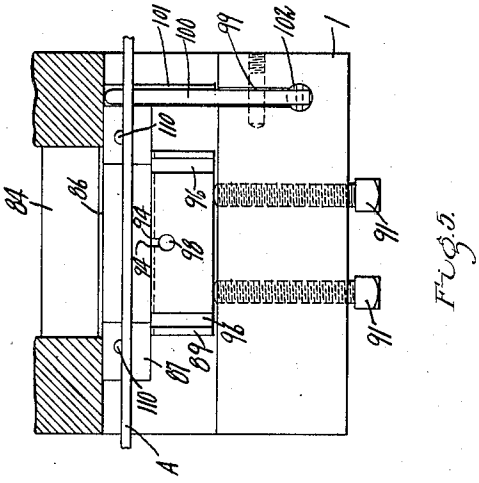


Fig. 5.

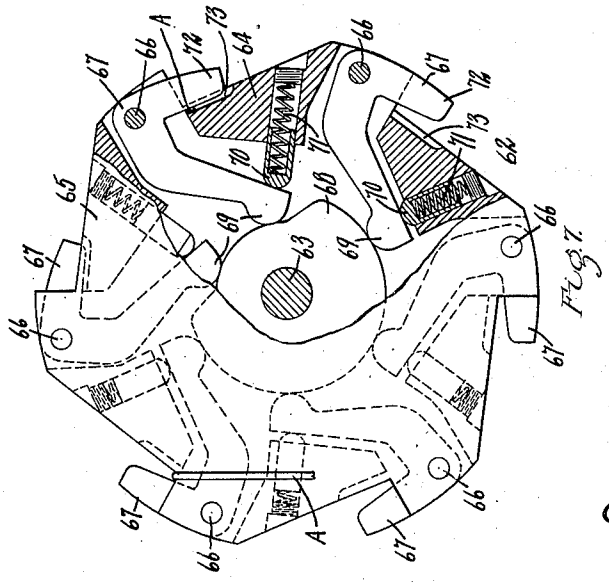


Fig. 7.

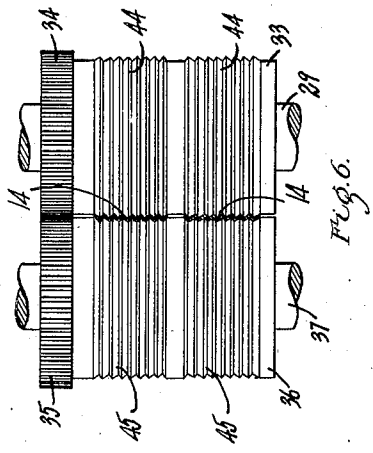


Fig. 6.

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LACE TIPPING MACHINE

Filed Feb. 19, 1924 4 Sheets-Sheet 4

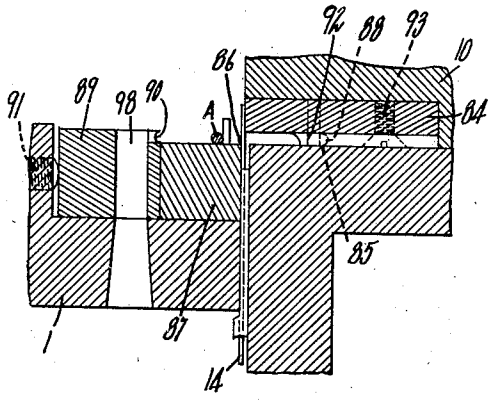


Fig. 10.

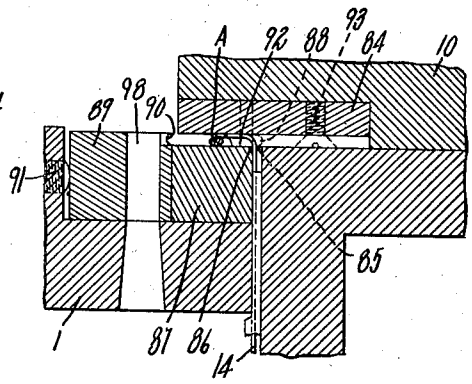


Fig. 11.

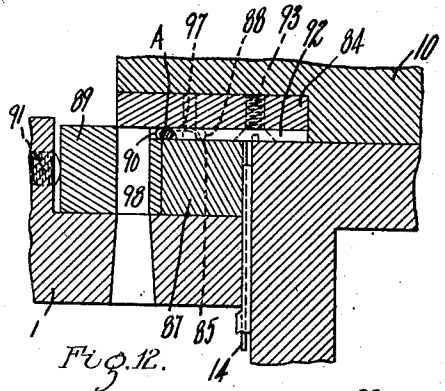


Fig. 12.

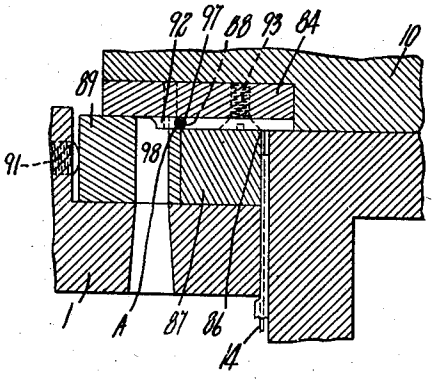


Fig. 13.

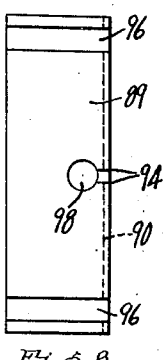


Fig. 8.

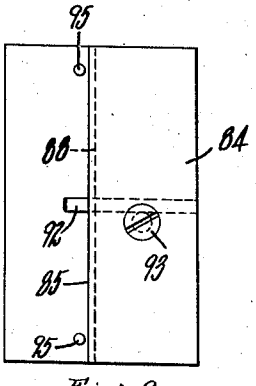


Fig. 9.

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Patented Dec. 28, 1926. 1,611,933

UNITED STATES PATENT OFFICE.

CARL A. MATSON, OF LYNNFIELD, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SHOE LACE COMPANY, LTD., OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

LACE-TIPPING MACHINE.

Application filed February 19, 1924. Serial No. 693,910.

My present invention relates to lace tipping machines, and more particularly to an improved automatic machine for applying tips of metal or non-metal to lacings of any length.

Applying a tip to the ends of lacings has been, heretofore, essentially a hand operation in that it was necessary to manually position the end of a lacing in position in a forming die. After the positioning operation, the operator pressed a treadle to cause the die to close on the end of the lacing and roll or form the tip on the lacing. Because of the relatively low price at which lacings are sold, the margin between manufacturing cost and selling cost was too low to allow a reasonable profit to the manufacturer, and attempts have been repeatedly made to perform the tipping operation automatically and by machine. The ideal machine for this purpose is one that will take a lacing of indefinite length, feed the same continuously, divide and separate such lacing into a plurality of lacings of predetermined length, move the said plurality of lacings into position relative to a predetermined amount or length of tipping material, apply the tip to the ends of the lace, and bunch such tipped laces into bundles of predetermined size or number.

My present invention is capable of carrying out this ideal set of operations or process and in practicing my invention, I do not limit myself to the use of sheet material—either metal or non-metal—as my invention is broad enough to include the use of mouldable material.

The principal object of my invention is to provide a machine for automatically feeding lacing directly from a skein, hank, or original package, measuring the lacing so fed, holding the same under tension and while so held applying tips thereto, severing the lacing and assembling or collecting the completely tipped laces in bunches or groups, gross lots, or the like. In other words, the object of my invention is to provide a machine which is complete and automatic in its operation and whereby the skein or original package of lacing is handled, fed, measured, tipped, separated, and the completed laces assembled in a convenient manner and location to be removed from the machine.

Another object of my invention is to provide a machine which will produce a number of tipped laces, whether they are short or long, the adjustment of the measuring devices not in the least delaying or slowing up the operation of the machine.

The invention contemplates the provision of novel mechanism for positioning the lacing in order to have a tip applied by tip forming instrumentalities, provision being made for automatically preventing the material from which the tip is formed from being fed to the machine if the lacing is not in position to receive the tip.

The machine of this invention also embodies instrumentalities for corrugating the strip of sheet material from which the tip is formed.

The machine of this invention also embodies a novel rotary mechanism for continuously feeding the lacing to the positioning instrumentalities so that the lacing is continuously fed to instrumentalities which then move it transversely thereof and position it in readiness to have two pieces of tipping material applied thereto and to be severed.

The invention consists particularly in means and mechanisms for automatically and continuously feeding lacing and preferably measuring it, in combination with mechanism for positioning said lacing and mechanism for applying tipping material thereto.

The invention further consists in the combination and arangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings:

Fig. 1 is a longitudinal sectional elevation of a lace tipping machine embodying my invention;

Fig. 2 is a front elevation of the same;

Fig. 3 is an enlarged sectional elevation taken on the line 3—3 of Fig. 2 as viewed in the direction of the arrows:

Fig. 4 is a sectional elevation taken on the line 4—4 of Fig. 2, as viewed in the direction of the arrows;

Fig. 5 is a sectional plan view of the work

support and a portion of the tip forming instrumentalities;

Fig. 6 is a plan view of the rolls which simultaneously feed the strips of sheet material for forming the tips and form the corrugations therein;

Fig. 7 is a side elevation, partly broken away and shown in section, of the lacing clamping and positioning instrumentalities;

Fig. 8 is a top plan view of the stationary tip forming member;

Fig. 9 is an underneath plan view of the movable tip forming member;

Figs. 10, 11, 12, and 13 are detail sections illustrating the steps employed in forming the tip upon the lacing, and

Fig. 14 is a detail side elevation illustrating the means for guiding the lacing to the machine.

In the drawings, 1 represents the frame of the machine upon which is mounted in bearings 2 a main driving shaft 3 driven by a pulley 4. An eccentric 5 is fastened to the shaft 3 and is provided with an eccentric strap 6 which is adjustably connected by a rod 7 to a member 8, said member being pivotally connected by a pin 9 to a slide 10. The slide 10 is arranged to slide in ways 11 provided in the frame 1 and the position of said slide may be adjusted by means of the rod 7 which is provided with right and left hand screw-threaded portions engaging respectively the member 8 and the eccentric strap 6. The rod, when adjusted, is locked to the member 8 and to the eccentric strap 6 by lock nuts 12 and 13 respectively.

Tip material feeding instrumentalities.

A pair of strips of sheet material 14 from which the tips are formed are placed side by side with a short distance intervening between their adjacent edges and fed vertically into a position to be engaged by the tip forming instrumentalities by the following mechanism:—A lug 15 projects downwardly from the slide 10 and has fastened thereto a cam 16 which is adjustably secured to said lug by a bolt 17 which passes through a slot 18 provided in said cam. The working surface of the cam 16 comprises an inclined edge 19 and a horizontally disposed edge 20 which constitutes a rest. A cam roll 21 is rotatably mounted upon a lever 22 which is pivoted at 23 to the frame of the machine. A spring 24 holds the roll 21 constantly in engagement with the working surface of the cam 16. The outer end of the cam lever 22 is provided with a slot 25 through which extends a stud 26 which is adjustably mounted in a slot 27 provided in an arm 28 pivoted upon a shaft 29 rotatably mounted in the frame 1. A pawl 30 carried by the arm 28 is held in engagement with a ratchet 31 by a spring 32. The ratchet 31 is fast to the shaft 29, and a rocking movement imparted to the arm 28 by the lever 22 and cam 16 will cause the ratchet 31 to be rotated a predetermined number of teeth during each forward movement of the reciprocatory slide 10. The number of teeth engaged by the pawl 31 with each rocking movement of the lever 22 may be varied by adjusting the location of the stud 26 upon the lever 22. A feed roll 33 is fastened to the shaft 29 and has a spur gear 34 fast thereto and meshing into a spur gear 35 which, in turn, is fast to another feed roll 36 which is rotatably mounted upon a shaft 37 supported upon a pair of arms 38 forming a portion of a lever 39 which is pivoted to rock upon a shaft 40 supported upon the frame 1. An arm 41 forming a part of the lever 39 is located upon the opposite side of the shaft 40 from the arms 38, and said arm 41 is provided with an adjusting screw 42 which extends therethrough and has a shoulder formed thereon and between said shoulder and a portion of the frame 1 a spring 43 is located which acts to force the feed roll 36 against each of the strips of sheet material 14 thereby causing said strips to be fed simultaneously as the feed rolls are rotated. The feed rolls 33 and 36 are each provided with two sets of corrugations 44 and 45 which co-act to form corrugations upon the strips 14 as they are fed between the rolls.

Lacing feed mechanism.

The lacing material A is placed in a suitable receptacle 46 in the form of a skein, hank or original package as it comes from the manufacturer or jobber and said lacing material extends from the receptacle 46 through a stand 47 to a guide tube 48 which is adjustably fastened by a screw 49′ to the outer end of an arm 49. A suitable tension is imparted to the lacing A as it passes through a hole 111 in the stand 47 by a presser 112, spring 113 and screw 114. The presser is forced against the lacing A with a yielding pressure by means of the screw 114 and the spring 113 which is interposed between the screw 114 and the presser 112. The arm 49 is adjustably fastened by a screw 50 to a rotary shaft 51 which is mounted in bearings 52 and 53 on the frame of the machine and has a rotary motion imparted thereto by a bevel gear 54 which meshes into a bevel gear 55 fast to a shaft 56 and upon said shaft 56 is also fastened a sprocket gear 57 which is connected by a sprocket chain 58 to a sprocket gear 59 fast to the shaft 3. By this mechanism it will be seen that the lacing A is rotated about the shaft 51, and as it rotates it consecutively engages a pair of pins 60 which are adjustably fastened to rods 61 spaced apart and fastened to the frame 1. Said lacing also, during one rotation of the shaft 51 and the arm 49 and

guide 48, engages and is laid upon a pair of lacing positioning members 62 forming a part of the

Lacing positioning mechanism.

Referring now to Figures 1, 2 and 7 the rotary lacing positioning members 62 are fastened to opposite ends of a shaft 63 and each of said rotary positioning members embodies therein a main body portion 64 and side plate 65 between which are pivotally mounted upon pins 66 a plurality of clamping members 67. A stationary cam 68 is located upon each side of the frame 1 and is fastened thereto. The inner ends of the clamping members 67 are rounded at 69 and said ends are forced by plungers 70 and springs 71 against the working surface of the cam 68. The outer ends 72 of the clamping members 67 provide a means for first hooking the lacing A to the rotary positioning member 62 and finally clamping said lacing to said rotary member, at which time the ends 72 co-operate with recesses 73 formed in the periphery of the main body portion 64 to securely grip the lacing A. As the feed arm 49 and guide 48 are rotated as hereinbefore described the lacing A is laid upon the positioning members 62 behind the outer ends 72 of the clamping members 67 as illustrated in Fig. 1, and said lacing A is then, upon a continued rotation of the guide 48 and feed arm 49 carried downwardly and beneath the pins 60 and then upwardly and again across the positioning members 62, but this time the lacing will be laid behind the outer ends 72 of another pair of clamping members, said positioning members 62 having an intermittent rotary motion imparted thereto by a ratchet 74 which is fastened to the shaft 63 and is intermittently rotated by a pawl 75, see Figs. 1 and 4, which is pivoted at 76 to an arm 77 fast to a gear 78 which is loosely mounted to rotate upon the shaft 63. The pawl 75 is held in engagement with the ratchet 74 by a spring 79. An oscillatory motion is imparted to the gear 78 by a rack 80 which is formed upon a rod 81 and is adjustably attached by nuts 82 to an angle bar 83. The angle bar 83 is fastened by the bolt 17 to the lug 15 on the opposite side thereof from that upon which the cam 16 is fastened.

Tipping material severing instrumentalities.

The instrumentalities for severing a piece of material from each of the strips 14, rolling each of said pieces so severed around the lacing A and severing the laces between the pieces of material while the same are being rolled around the lacing are as follows:—Referring to Figs. 1, 3, 8, 9, 10, 11, 12 and 13, the slide 10 has fastened thereto a member 84 which is provided with a cutting edge 85 adapted to co-operate with a cutting edge 86 on a work support 87. The member 84 is furthermore provided with a tip forming recess 88 having a curved rear wall which intersects the cutting edge 85. The member 84 constitutes a movable tip forming member. A stationary tip forming member 89 abuts against the work support 87 and is provided with a curved tip forming recess 90. The work support 87 and the stationary tip forming member 89 each rest upon a horizontal portion of the frame 1 and are simultaneously clamped against a vertical portion of said frame by a pair of clamping screws 91. A cutter 92 is adjustably mounted upon the member 84 and is held in position by means of a screw 93, see Fig. 9. The cutting edge of the cutter 92 is preferably located a short distance in front of the tip forming recess 88. The cutter 92 co-operates with a stationary cutting edge 94 provided upon the tip forming member 89. Projecting downwardly from the undersurface of the tip forming recess 88 adjacent to the opposite sides of the member 84 are pins 95, while formed in the upper surface of the tip forming member 89 are grooves 96 into which the pins 95 may project during the forward movement of the member 84. As the slide 10 moves forward the front edge of the member 84 contacts with the upper end of each of the strips of sheet material 14 as illustrated in Fig. 10 bending said material and folding it so as to rest upon the lacing A as illustrated in Fig. 11. The cutting edges 85 and 86 then co-operate to sever a piece of material 97 from each strip 14 and to push the lacing with a piece of material resting thereon forwardly as illustrated in Fig. 12. As the forward edge of each piece of material 97 reaches the curved recess 90 in the tip forming member 89 said forward edge commences to bend around the lacing but before the completion of this operation the cutter 92 co-operates with the stationary cutting edge 94 to sever the lacing between the two pieces of material 97. Subsequent to the severing of the lacing A, but still prior to the completion of the operation of bending the pieces of material 97 around the lacing, the pins 95 engage the lacing A and push the same a short distance into the grooves 96. This pulls the severed ends of the lacing outwardly a short distance and at the completion of the operation of rolling the pieces 97 around the lacing, the material comprising the tip will project a short distance beyond the end of the lacing and because of the lack of material at the extreme end of the finished tip, the tendency will be to form a more pointed tip than would be the case if the lacing extended to the extreme end of the tip. A hole 98 is provided in the tip forming member 89 in alignment

with the cutter 92 and the short piece of lacing cut from the length of lacing when the same is severed is pushed by the cutter into said hole and drops downwardly therethrough.

It is evident that if, for any reason, the lacing positioning mechanism fails to deposit the lacing A upon the work support 87 preparatory to having tipping material attached thereto, it is desirable that there shall not be a piece of material 97 severed from each of the strips 14, thereby preventing waste of said material, and also preventing an unused piece of said material from clogging the tip forming instrumentalities. Means are, therefore, provided for preventing the strips of sheet material from being fed if the lacing A is not properly clamped by the clamping member 67 of the lace positioning member 62 and deposited in position upon the work support 87 to receive the tipping material. Pivotally mounted upon the frame 1 at 99 is a lever 100 in a position to be engaged by the lacing A just prior to being deposited upon the work support 87 as said lacing is carried around the positioning members 62 as hereinbefore described. The normal position of the lever 100 is illustrated in dotted lines in Fig. 1. A flat spring 101 engages the underside of the lever 100 and acts to always force said lever upwardly. The lever 100 is operatively connected with a vertical pin 102 which, in its lowered position, projects in the path of an arm 103 which is pivoted at 104 to the frame 1. A link 105 connects the arm 103 with the shaft 37 upon which the feed roll 36 is mounted. The shaft 63 has fastened thereto in vertical alignment with the arm 103, a member 106 which is provided with a plurality of raised portions 107 formed upon the periphery thereof which are adapted to contact with a projection 108 formed upon the arm 103 and intermittently rock said arm a sufficient distance to allow the pin 102 to drop in the path of the upper end of the arm 103. As each raised portion 107 of the member 106 engages the projection 108 on the arm 103 said arm will be rocked thereby pulling the feed roll 36 out of engagement with the strips of sheet material 14 and permitting the pin 102 to fall behind the upper end of the arm 103 thereby relieving the pressure upon the material 14. As long as there is no lacing A present between the clamping jaws of the lacing positioning instrumentalities the strip of sheet material 14 will fail to feed, but when said lacing is properly clamped in position, as said lacing is deposited upon the work support 87 as hereinbefore set forth, said lacing will engage the lever 100 forcing the long arm thereof downwardly thereby raising the pin 102 from behind the arm 103 and again allowing the spring 43 to force the feed roll 36 against the strips of material 14 and thereby allow the material to be fed. After the two pieces of sheet material 97 have been applied to the lacing A and the lacing severed therebetween, the completed lacing falls downwardly upon a pair of supporting pins 109 which are adjustably fastened to the rods 61 and as the machine continues to operate, the finished lacings are thus positioned upon the pins 109 and are removed therefrom by the operator of the machine from time to time.

General operation.

The general operation of the machine hereinbefore specifically, and to some extent in general described is as follows:—The lacing A extending through the guide tube 48 is carried by said guide tube and by the arm 49 and by the shaft 51 across the positioning members 62 and is laid between the ends 72 of the clamping members 67 and the body portion 64 of said positioning members as illustrated at the left of Fig. 7. A continued rotation of the shaft 49 and guide tube 48 carries the lacing downwardly at the right and beneath one of the pins 60, then across to the other pin 60 at the other side of the machine and upwardly. During the latter part of this feeding movement of the lacing A, the said lacing which has been fed to the positioning members as hereinbefore described, will be automatically gripped by the clamping members 67 and carried rearwardly and eventually deposited upon the work support. As the lacing A is deposited upon the work support, it will come in contact with the lever 100, the normal position of which is as illustrated in dotted lines, Fig. 1, and at this time the feed roll 36 is held out of engagement with the strips of sheet material 14. When the lacing A engages the lever 100 the long arm thereof is forced downwardly thereby lifting the pin 102 and releasing the arm 103 whereupon the feed roll 36 will be forced against the strips of sheet material 14 by the spring 43. The lacing A is deposited by the lacing positioning instrumentalities upon the work support 87 toward the end of the rearward movement of the slide 10 and is positioned by said positioning instrumentalities against two gauge pins 110 which project upwardly from the work support 87. The lacing A is deposited by said lacing positioning instrumentalities upon the work support toward the end of the rearward movement of the slide 10 and immediately thereafter with the first portion of the next forward movement of said slide 10 the strips of sheet material 14 are fed upwardly by the feed rolls 36 and 33 the required distance. If for any reason the lacing is not properly fed by the feeding instrumentalities and not deposited upon the work support, the lever 100 will not be moved and the feed roll 36 being out of con-

tact with the strips of sheet material 14 will fail to feed said material. This will prevent any clogging of the tip forming instrumentalities by preventing a tip from being formed if there is no lacing present to receive said tip.

Immediately following the feeding operation of the strips of sheet material 14 the member 84 of the tip forming instrumentalities will engage the upper end of each of the strips 14 bending them upon the lacing A which is resting upon the work support, and while thus bent, pieces of material 97 are severed from the rest of the strips and rolled around the lacing. During the operation of rolling the pieces of material 97 around the lacing A the movable cutter 92 co-operating with the stationary cutting edge 94 severs the lacing between the pieces of tipping material, and the lacing is then immediately engaged by the pins 95 and pushed into the grooves 96 thereby separating the severed ends of the lacing and pulling said severed ends a short distance into the interior of the tip. The member 84 now arrives at the very end of its forward movement, at which time the recess 88 thereof and the recess 90 of the tip forming member 89 will all co-operate to form and clinch two pieces of material 97 around the lacing thereby completing the tips.

It will be understood that the mechanisms hereinbefore described are so timed in relation to each other that the lacing A is fed consecutively to each pair of clamping members 67 on the positioning members 62 and that while said positioning members are carrying the lacing forward to the work support to have tipping material attached thereto, said lacing passes around beneath the pins 60 and then upwardly again to lay the lacing across the pair of positioning members and beneath the jaws of another pair of clamping members. It will be evident that the length of the lacing depends upon the position of the pins 60 with relation to the positioning members 62 and that by lowering said pins 60, the length of the lacing fed to the positioning members will be correspondingly increased and by raising said pins, the length of the lacing fed to the positioning members at each rotation of the shaft 51 will be diminished and thus lacings of any desired length may be measured off on the machine by adjusting the position of the pins 60 relatively to the positioning members 67.

It will be understood that as shown in Fig. 1 of the drawings the guide tube 48 is positioned at a distance from the axis of the shaft 51 sufficient to allow said guide tube to just clear the measuring pins 60. If the pins are adjusted upwardly to secure the feeding of a shorter lacing to the machine, then the arm 49 with its guide tube 48 is adjusted correspondingly toward the axis of the shaft 51, and if the measuring pins 60 are lowered upon the rod 61, then the arm 49 with its guide tube 48 is adjusted to carry the guide tube a corresponding distance away from the axis of the shaft 51, and after the guide tube has been thus adjusted in each case to just clear the measuring pins 60, it is locked in adjusted position by means of the set screw 50 which locks the arm 49 rigidly to the shaft 51.

It should be distinctly understood that the term lacing as used in the specification and in the claims which follow designates the material of which the finished laces are composed.

Having thus described my invention, what I claim as new is:

1. A lace tipping machine having, in combination, tip material supplying means, positioning devices cooperating with said tip material supplying means, and automatic lacing feeding means adapted to feed lacing to said positioning devices while said lacing is under tension from the grip of said positioning devices on the lacing previously fed.

2. A lace tipping machine, having, in combination, means to apply tipping material to the lacing, means to feed successive portions of a continuous lacing to said tipping devices, means to adjust the relative length of the lacing portions so fed, and means to tip and complete laces of different lengths at the same speed of operation.

3. A machine of the kind described, having mechanism to apply tipping material to laces, means to supply said material, means to position lacing relatively to the tip applying mechanism, automatic means to feed lacing to successive positioning members from a continuous length of lacing, together with means controlling the tipping of each lace by the successive portions of the lacing held by the positioning devices.

4. A lace tipping machine having, in combination, means to apply tipping material to a lace, means to feed lacing to said tipping devices, said feeding means comprising a movable member and a guide, each adjustable to predetermine the length of lacing fed to said tipping devices.

5. A lace tipping machine having, in combination, a work support, means to feed a strip of sheet material, means to position lacing upon said work support, rotary means to continuously feed lacing to said positioning means, means to sever a piece of material from said strip, means to apply said piece around said lacing and means to sever said lacing.

6. A lace tipping machine having, in combination, means to apply tipping material to a lacing, means to supply said material, mechanism to position the lacing to be tipped

by moving said lacing transversely thereof, a rotary member, a lacing guide on said rotary member adapted to continuously feed lacing longitudinally thereof to said positioning means and means to regulate the length of lacing fed to said positioning means at each rotation of said rotary member.

7. A lace tipping machine having, in combination, means to apply tipping material to a lacing, means to supply said material, mechanism to position the lacing to be tipped by moving said lacing transversely thereof, a rotary member, a lacing guide on said rotary member adapted to continuously feed lacing longitudinally thereof to said positioning means and a pair of pins located beneath said positioning means adapted to be engaged by said lacing during the rotation of said rotary member.

8. A lace tipping machine having, in combination, means to feed a strip of sheet material, a work support, a pair of lacing positioning members, rotary means adapted to continuously feed lacing to said lacing positioning members, means to clamp lacing to each of said lacing positioning members, means to intermittently rotate said lacing feeding members and feed said lacing transversely thereof and deposit the same upon said work support, means to sever a piece of material from said strip, means to roll said piece of material around said lacing and means to subsequently sever said lacing.

9. A lace tipping machine having, in combination, means to feed a strip of sheet material, a work support, a pair of lacing positioning members, rotary means adapted to continuously feed lacing to said lacing positioning members, means to clamp lacing to each of said lacing positioning members, means to intermittently rotate said lacing positioning members and feed said lacing transversely thereof and deposit the same upon said work support, means to sever a piece of material from said strip, means to roll said piece of material around said lacing, means to sever said lacing and means to regulate the length of lacing fed to said positioning members at each rotation of said rotary means.

10. A lace tipping machine having, in combination, means to feed a strip of sheet material, a work support, a pair of lacing positioning members, rotary mechanism adapted to continuously feed lacing to said lacing positioning members, means to intermittently rotate said lacing positioning members in unison and feed said lacing transversely thereof and deposit the same upon said work support, means to sever a piece of material from said strip, means to roll said piece around said lacing and means to subsequently sever said lacing.

11. A lace tipping machine having, in combination, means to feed a strip of sheet material, a work support, a pair of lacing positioning members, rotary mechanism adapted to continuously feed lacing to said lacing positioning members, means to intermittently rotate said lacing positioning members in unison and feed said lacing transversely thereof and deposit the same upon said work support, means to sever a piece of material from said strip, means to roll said piece around said lacing, means to subsequently sever said lacing and means adjustable toward and away from said lacing positioning members adapted to regulate the length of lacing fed to said positioning members at each rotation of said rotary feeding means.

In testimony whereof, I have signed my name to this specification.

CARL A. MATSON.